

CLAIMS

1. An audio terminal for operating at uncontrolled audio environment having an echo suppression unit for reducing an acoustic feedback, wherein said echo suppression unit comprising:
- 5 a learner for learning an audio environment of said audio terminal;
and
a control unit for controlling said acoustic feedback in accordance with said audio environment of said audio terminal.
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2. The audio terminal of claim 1, wherein said echo suppression unit further includes a state machine which can be at least in one of a transmit state, a receive state and an idle state, and wherein the learner comprises:
- 15 a timing learner for measuring a time of an active audio in each one of the receive state and transmit state of said state machine for providing a timing index to said control unit; and
an energy learner for measuring an energy of an active audio in each one of the receive state and transmit state of said state machine for providing an energy index to said control unit.
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3. The audio terminal of claim 1, wherein said control unit comprises:
- At least two energy estimators for measuring an audio energy of each one of the receive audio stream and transmit audio stream for providing measurements to said energy learner;
- 25 an attenuation table being updated by said energy learner and said timing learner for providing attenuation values to an attenuation unit for adjusting receive stream and transmit stream amplifier in accordance with said attenuation values.
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4. The audio terminal of claim 3, wherein the control unit additionally comprises:

a decision unit for receiving signals corresponding to an audio activity at said receive and transmit streams from said energy estimates units, receiving at least one value from a threshold table for providing a signal corresponding to an voice activity decision; and

5 a state memory and hangover logic unit for receiving said voice activity decision and providing an state machine index to said attenuation table which provides at least one attenuation parameter to said attenuation unit in accordance with said audio terminal state machine state.

10 5. An echo suppression unit for reducing acoustic feedback comprising:

a learner for learning an audio environment of said audio terminal;
and

15 a control unit for controlling said acoustic feedback in accordance with said audio environment of said audio terminal.

6. The echo suppression unit of claim 5, additionally comprising:

a state machine configured for at least one of a transmit state, a receive state and an idle state; and

20 wherein said learner comprises:

a timing learner for measuring a time of an active audio in each one of the receive state and transmit state of said state machine for providing a first index to said control unit; and

25 an energy learner for measuring an energy of an active audio in each one of the receive state and transmit state of said state machine for providing a second index to said control unit.

7. The echo suppression unit of claim 5, wherein said control unit comprises:

30 at least two energy estimators for measuring an audio energy of each one of the receive audio stream and transmit audio and for providing measurements to said energy learner; and

an attenuation table being updated by said energy learner and said timing learner for providing attenuation values to an attenuation unit for adjusting receive stream and transmit stream attenuation with accordance to said attenuation values.

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8. The echo suppression unit of claim 7, wherein said control unit further comprises:

a decision unit for receiving signals corresponding to an audio activity at said receive and transmit streams from said energy estimates units, receiving at least one value from a threshold table for providing a voice activity decision; and

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a state memory and hangover logic unit for receiving said voice activity decision and providing a state machine index to said attenuation table which provides at least one attenuation parameter to said attenuation unit in accordance with said echo suppression state machine state.

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9. A learner for learning audio parameters of an uncontrolled audio environment comprising:

a timing learner for measuring a time of an active audio of an audio stream for providing a timing parameters; and

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an energy learner for measuring a time of an active audio of an audio stream for providing an energy parameters wherein a combination of said timing and energy parameters provides an indication of a type of said uncontrolled audio environment.

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10. The learner of claim 9, wherein said timing learner comprises:

at least one timer for measuring a time of active audio presence on at least one audio stream;

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means for processing said at least one timer measurements; and

a decision logic unit for receiving a processed timer parameters and audio environment parameter for providing an indicator or a type of said uncontrolled audio environment.

- 5 11. The learner of claim 9, wherein said energy learner comprises:
- means for receiving audio energy measurements;
 - means for processing said energy measurements; and
 - a decision logic unit for receiving a processed energy parameters and audio environment parameter for providing an indication of a type of
- 10 said uncontrolled audio environment.

12. The learner of claim 9, wherein said timing and said energy learner are configured for operating in a predetermined time frame and for ceasing functioning when each decision logic unit of said timing learner and said energy learner is reaching a decision.

- 15 13. A method of controlling acoustic feedback of an audio terminal having a plurality of audio states which include at least a transmit audio state, at least a receive audio state and at least an idle audio state wherein the method comprising the steps of:
- 20 providing a first learner for learning the timing characteristics of said receive and transmit states for providing a first index;
- manipulating said first index with a second index for identifying a type of uncontrolled audio environment of an said audio terminal; and
- 25 controlling said acoustic feedback of said audio terminal in accordance with said identification.

14. The method of claim 13, wherein said step of controlling further comprises the steps of:
- a. setting said audio terminal in at least one state of said audio terminal
- 30 state machine;
- b. tuning said audio terminal in accordance with said audio environment.

c. transitioning to at least one other state of said audio terminal state machine; and

d. repeating steps (b) and (c) for at least one other state of said state machine.

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15. The method of claim 14, wherein said audio terminal parameters comprises at least the parameters of:

a discrimination threshold between audio stream activity/energy ratios;

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a set of attenuation values for the plurality of audio states of the state machine used on the receive and transmit audio streams; and

the hangover timings between state transition of said audio terminal state machine.

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16. The method of claim 15, wherein said first index and said second index are numeric values.